

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	IWASA, Shoji
Application No.:	10/674209
Filed:	September 29, 2003
For:	Polishing Composition and Rinse Composition
Examiner:	Michael A. Marcheschi
Group Art Unit:	1755

Mail Stop _____
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Docket No.: O112B-11333-US01

DECLARATION OF SHUHEI YAMADA

I, Shuhei Yamada state:

1. I am currently employed by FUJIMI INCORPORATED as an
Engineer in the Research and Development Section. I have been employed by
FUJIMI INCORPORATED as an Engineer, since April
1, 2000.

2. I am very familiar with the properties of water soluble polymers [and have published numerous papers dealing with shape memory materials]. I understand that a solution containing hydroxyethyl cellulose (HEC), polyethylene oxide (PEO) compounded in a quantity larger than 0.005% by weight and smaller than 0.5% by weight, an alkaline compound, water, and silicon dioxide is excellent at reducing haze level of wafer surfaces.

Best Available Copy

3. I have reviewed US Application 10/674209. The following additional information and tables illustrate that the inventive concept disclosed in the application are unexpected synergistic wafer surface haze reducing properties present in the solution described in the application. Table A includes figures described in 10/674209 detailing the synergistic effects of the claimed solution. Table B is new data demonstrating that PEO and HEC when not mixed together are far less effective wafer surface haze reducers.

4(a). Supplemental Examples

Tables A and B provide factual evidence of the superior unexpected synergistic action of HEC and PEO. Table A shows Supplemental Examples of polishing compositions according to the present invention. Table B shows Supplemental Comparative Examples of polishing compositions (what the specification refers to as "conventional polishing slurries"). Supplemental Examples 1-3, 5, and 6 are identical to Examples 1-3, 5, and 6 shown in Table 1 of the specification. Supplemental Comparative Examples 1 and 9 are identical to Comparative Examples 1 and 9 shown in Table 2 of the specification.

4(b). Supplemental Examples 1, 1a, 6, and 6a

Concentrations of PEO in the polishing compositions of Supplemental Examples 1, 1a, 6, and 6a and Supplemental Comparative Example 9 are the same. The polishing results of Supplemental Examples 1, 1a, 6, and 6a are better than that of Supplemental

Comparative Example 9. This supports the synergistic effect of HEC and PEO. This suggests that PEO enhances the haze level reduction effect of HEC.

4(c). Supplemental Examples 1 and 1a

Concentration of HEC in the polishing composition of Supplemental Example 1a is lower than that of Supplemental Example 1. Supplemental Examples 1 and 1a have substantially the same result. This means that the synergistic effect of HEC and PEO is obtained even if concentration of HEC is relatively low. Also, it is understood that the synergistic effect of HEC and PEO does not vary in proportion to the concentration of HEC when concentration of HEC is relatively low.

4(d). Supplemental Examples 6 and 6a

Concentration of HEC in the polishing composition of Supplemental Example 6a is higher than that of Supplemental Example 6. Supplemental Examples 6 and 6a have substantially the same result. This supports that the synergistic effect of HEC and PEO is obtained even if concentration of HEC is relatively high. It is also understood that the synergistic effect of HEC and PEO does not vary in proportion to the concentration of HEC when concentration of HEC is relatively high.

4(e). Supplemental Examples 2, 2a, 3, 5, and 5a

Concentrations of HEC in the polishing compositions of Supplemental Examples 2, 2a, 3, 5, and 5a and Supplemental Comparative Example 5 are the same.

Supplemental Examples 2, 2a, 3, 5, and 5a demonstrate excellent results in all of haze

level, LPD, and surface conditions. This supports the synergistic effect of HEC and PEO.

4(f). Supplemental Comparative Examples 5-5d and 9-9d

As shown in Table B, the polishing compositions of Supplemental Comparative Examples 5-5d contain HEC at different concentrations. Haze levels of Supplemental Comparative Examples 5-5d are poor with respect to those of Supplemental Examples. The polishing compositions of Supplemental Comparative Examples 5a and 5d can not improve LPD's. Note that the polishing composition of Supplemental Comparative Example 5 deteriorates surface conditions. Accordingly the use of HEC alone does not provide excellent haze level reduction of a wafer surface without deteriorating LPD and surface conditions of the wafer surface.

The polishing compositions of Supplemental Comparative Examples 9-9d contain PEO at different concentrations. The polishing results of Supplemental Comparative Examples 9-9d are poor. It is not apparent that PEO has a function of haze level reduction or enhances the haze level reduction effect of HEC based on the Supplemental Comparative Examples 9-9d.

4(g). Supplemental Examples Conclusion

The polishing composition according to the present invention provides excellent haze level reduction of a wafer surface without deteriorating LPD and surface conditions of the wafer surface. This advantage is not obvious from the teachings of the references.

5. I declare that all statements made herein of my knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date: _____

Signature: _____

f:\wpwork\bec\11333us01_sts_20050405.doc

statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date: April 13, 2005

Signature: Shuhei Yamada

f:\wpwork\bec\11333us01_sta_20050405.doc

86

Table A

Supplemental Examples	Ingredient for reducing haze level			Ingredient for enhancing polishing rate		haze level	LPD	surface condition
	name	MW (x 10 ³)	wt%	name	wt%			
1a	PEO	1200	0.01	AM	1.0	⊙	Δ	-
1	PEO	1200	0.1	AM	1.0	⊙	Δ	-
2a	PEO	1200	0.25	AM	1.0	⊙	Δ	○
2	PEO	1200	0.25	AM	1.0	⊙	Δ	○
3	PEO	1200	0.25	AM	1.0	⊙	Δ	⊙
5	PEO	1200	0.25	AM	1.0	⊙	Δ	⊙
5a	PEO	1200	0.25	AM	1.0	⊙	Δ	-
6	PEO	1200	0.5	AM	1.0	⊙	Δ	-
6a	PEO	1200	1	AM	1.0	⊙	Δ	-

Table B

Supplemental Comparative Examples	Ingredient for reducing haze level			Ingredient for enhancing polishing rate		haze level	LPD	surface condition
	name	MW (x 10 ³)	wt%	name	wt%			
Comp. Ex. 2a	PEO	1200	0.01	AM	1.0	Δ	Δ	-
Comp. Ex. 2b	PEO	1200	0.1	AM	1.0	○	Δ	-
Comp. Ex. 5	PEO	1200	0.25	AM	1.0	○	Δ	×
Comp. Ex. 5a	PEO	1200	0.5	AM	1.0	○	Δ	×
Comp. Ex. 5d	PEO	1200	1	AM	1.0	○	Δ	×
Comp. Ex. 8a				AM	1.0	×	×	-
Comp. Ex. 8b				AM	1.0	Δ	×	-
Comp. Ex. 8				AM	1.0	○	×	-
Comp. Ex. 8a				AM	1.0	Δ	×	-
Comp. Ex. 8d				AM	1.0	×	×	-

HEC: hydroxyethyl cellulose

PEO: polyethylene oxide

AM: 20wt% ammonium solution

As for evaluation of the polishing results, see the specification.

Examples 1-9, 5, 6, and Comparative Examples 5, 8 were described on the originally filed specification. Examples 1a, 2a, 5a, 6a, and Comparative Examples 5a-5d, 8a-8a are newly presented.

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☒ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER:** _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.